

Investigation of the Creep Failure of Steel SOV/129-58-11-4/13

results of experimental and theoretical work of other authors, the following conclusions are arrived at: long duration failure at elevated temperatures is preceded by the formation of a loosened zone with an increased concentration of accumulations of vacancies in the crystal lattice; this process leads to a weakening of the interatomic bond forces in the highest stressed volumes of the metal which brings about favourable conditions for forming nuclei of micro and macro-cracks. There are 4 figures, 2 tables and 14 references, 11 of which are Soviet, 3 English.

ASSOCIATION: TsNIITMASH

1. Steel--Creep 2. Steel--Failure 3. Steel--Mechanical
properties 4. Steel--Test results

Card 3/3

PHASE I BOOK EXPLOITATION

80V/3790

Tula. Mekhanicheskiy institut

Vliyaniye obrabotki na strukturu i svoystva metalla; sbornik statey.
(The Effect of Machining on the Structure and Properties of Metals;
Collection of Articles), Moscow, Oborongiz, 1959. 76 p. (Series:
Its: Trudy, vyp. 11) No. of copies printed not given.

Ed.: M.A. Krishtal, Candidate of Technical Sciences, Docent. Ed. of Publishing
House: S.I. Vinogradskaya. Tech. Ed.: V.I. Oreshkina. Editorial Board:
S.S. Petrukhin (Chairman) and Resp. Ed. of Series, Director of the Institute,
Candidate of Technical Sciences, Docent; A.G. Gorst, Doctor of Chemical Sciences,
Professor; A.I. Lampsi, Doctor of Technical Sciences, Professor (deceased);
M.A. Mamontov, Doctor of Technical Sciences, Professor; A.N. Ter-Mkrtich'yan,
Candidate of Technical Sciences, Docent; V.D. Rozhkovskiy, Candidate of Physics
and Mathematics, Docent; D.G. Solomentsev, Candidate of Economic Sciences,
Docent; A.Ya. Shaydenko, Candidate of Technical Sciences, Docent (Scientific
Secretary)

PURPOSE: This collection of articles is intended for scientific and technical
personnel in the metalworking industry.

Card 1/4

The Effect of Machining (Cont.)

SOV/3790

COVERAGE: The articles were prepared by members of the Department of Physical Metallurgy, Tula Mechanical Institute, in conjunction with members of other departments and industrial personnel. The book deals with the effect of various conditions of heat treatment and mechanical treatment (shot peening and coining) on the structure and properties of ferrous metals. Proper conditions are indicated for annealing malleable iron and extending the life of machine parts under cyclic-impact loads. New data are given on working-out a method of internal burnishing with the use of mandrels. In addition, results of an investigation of the distribution of elements in alloys are presented. References, chiefly Soviet, accompany individual articles. No personalities are mentioned.

TABLE OF CONTENTS:

Preface

3

Mirkin, I.L. [Doctor of Technical Sciences, Professor] and
E.P. Rikman [Candidate of Technical Sciences]. Applica-
tion of Local Spectral Analysis to the Study of the
Distribution of Elements in Alloys

5

Card 2/4

The Effect of Machining (Cont.)

80V/3790

Glebov, A.D. [Engineer]. Effect of Various Methods of Work
Hardening on the Cyclic-Impact Strength of Steel

20

Extensive experimental data are given on the testing of steel of various types for durability under repeated impact. Treatment suitable for increasing the durability of hardened and tempered parts 10-15 times is discussed. One such effective method is shown to be coining.

Mirkin, I.L., and T.A. Sirenko, [Engineer]. Investigation of the
Surface Layer of Steel Formed by Internal Burnishing

32

This and the following article deal with the mechanical properties of the surface layer obtained under various conditions of burnishing. Extent of plastic deformation is determined, and diagrams of residual stresses along the cross section of specimens treated with mandrels are constructed. The effects of magnitude of interference and of the material of the mandrel are discussed.

Card 3/4

18(0)

PLANE I BOOK EXPLOITATION 507,216
 Akademiyu Nauk SSSR, Institut osnovnykh i tekhnicheskikh informatsii
 Metallurgiya SSSR, 1917-1977, [t.] : Metallurgiya informatsii
 Moscow, Metallurgizdat, 1979. 613 p. Errata slip inserted. 3,000
 copies printed.
 M. (title page); I. P. Bardin, Academician; Ed. (Inside book); G. V. Popov,
 Tech. Ed.; P. O. Isenb'yev.
 PUBLISHED: This book is intended for metallurgists.

COVERAGE: The articles in this collection present historical data on the
 achievements of Soviet metallurgy, both ferrous and nonferrous, during
 the period 1917-1977. Advances in theory and practice, during
 the period 1917-1977, are described. Many of the articles describe the
 application of metallurgical science to the development of the
 metallurgical industry. The articles also give an idea of the present status
 of metallurgical science. The articles are accompanied by a large number of
 references.
 Card 1/13

Various methods (metallographic, chemical, vacuum melting, etc.) for
 determining and removing nonmetallic inclusions and oxides from
 molten metal. Results of investigations are discussed.
 A. A. Boykov, USSR Academy of Sciences, Institute of
 Nonmetallic Inclusions
 Card 7/15

Various methods (metallographic, chemical, vacuum melting, etc.) for
 determining and removing nonmetallic inclusions and oxides from
 molten metal. Results of investigations are discussed.
 A. A. Boykov, USSR Academy of Sciences, Institute of
 Nonmetallic Inclusions
 Card 7/15

The author outlines the development of pyrometric methods in the USSR
 and then discusses specific questions of direct-reading and indirect
 pyrometry (electronic systems used in investigation of radiative capacity, pyrometric
 metallurgical processes, calibration of systems for color pyrometry,
 and measurement of actual temperatures in metallurgy for color pyrometry).
 A. A. Boykov, USSR Academy of Sciences, Institute of Nonmetallic Inclusions
 Card 8/15

The paper reviews the development of physical metallurgy in Russia and
 other countries during the nineteenth and twentieth centuries, tracing
 successive advances made in various branches of the science.
 Card 9/15

MIRKIN, I.L., doktor tekhn. nauk prof.; RIKMAN, E.P., kand. tekhn. nauk

Using local spectrum analysis to investigate the distribution
of elements in alloys. Trudy TMI no.11:5-19 '59. (MIRA 12:12)

(Alloys--Spectra) (Diffusion)

MIRKIN, I.L., doktor tekhn. nauk prof.; SIRENKO, T.A., inzh.

Studying the state of the surface layer produced by drawing the steel over a punch. Trudy TMI no.11:32-45 '59.

(Steel--Cold working) (Surfaces, Deformation of) (MIRA 12:12)

MIRKIN, I.L., doktor tekhn. nauk prof.; SIRENKO, T.A., inzh.

Investigating the effect of initial microstructure and technological factors on the state of the surface layer produced by drawing the steel over a punch. Trudy TMI no.11:46-65 '59.

(MIRA 12:12)

(Steel--Cold working) (Surfaces (Technology))

24(7)

SCV/46-23-2-55 57

AUTHORS: Mirkin, I. L., Rikman, E. P.

TITLE: On Some Particular Features of the Local Analysis of Complex Alloys

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959, Vol 23, Nr 9, pp 1167 - 1169 (USSR)

ABSTRACT: The distribution of chemical elements over the structural components of alloys, the grains of solid solutions and their boundaries, in diffusion layers, and in welding seams is mentioned in the introduction as being a problem of the investigation of alloys, and it is said that local spectroscopic analysis makes it possible to solve this problem. Reference is then made to an earlier paper by the two authors (Ref 1), in which the sample was connected as cathode and the high-frequency alternating current was rectified by kenc-trons. Special investigations showed that a blackening of the spectral lines is caused only by the vapors conveyed from the central zone of the crater into the spark space. The quantity of evaporated substance thus analyzed is not greater than $(1 - 2) \cdot 10^{-8}$ g, because this central zone has a dia-

Card 1/3

On Some Particular Features of the Local Analysis
of Complex Alloys

SOV/48-23-9-55/57

meter of only 0.08 mm. In this kind of analysis the discharge is localized by coating the electrode with an insulator (polythene). A microscope is used for the purpose of finding a suitable zone and for its metallographical checking. Figure 1 shows a calibration curve for the determination of the local magnesium content in cast iron of great strength in the micro-spectroscopic analysis, and the problem of the influence exercised by the structure of the alloy on the results is broached. Two possible causes of this effect are mentioned: 1) The non-uniform distribution of elements over the structural components. 2) The different conditions of the evaporation of the elements from the various phases of the alloys. In high-frequency discharges the latter is of no importance as shown by experiments. The non-uniform distribution of elements may be investigated by the above-described localized spectroscopic analysis and, in conclusion, several examples of such investigations are discussed. In this connection the distribution of magnesium in especially strong cast iron and in magnesium-containing cast iron, and quantitative analyses of refractory alloys are dealt with.

Card 2/3

On Some Particular Features of the Local Analysis
of Complex Alloys

SOV 8-04-9-55-57

Special samples were used for the investigation of the diffusion layers, consisting of metal sources and metal solvent. The curve shown by figure 2, which describes the distribution of molybdenum in its diffusion in pure iron, made it possible to calculate the diffusion coefficients. The diffusion of Mo in pure Fe was investigated by means of the tracer method. There are 2 figures, 2 tables, and 4 Soviet references.

ASSOCIATION: Tul'skiy mekhanicheskiy institut (Tula Mechanics Institute)

Card 3/3

MIRKIN, I. L., doktor tekhn. nauk prof.

Atomic mechanism of aging of composite heat-resistant alloys.

[Trudy] TSNIIIMASH 100 100:9-25 '59. (MIRA 13:7)

(Heat-resistant alloys—Metallography)

NOTATION FOR I STAGE

Iskenderiya sent. 2282. Buzhary svet po problem sharyochayn eplovor
Iskenderiya po sharyochayn eplovor, tom 6 (Investigations of Shari-
ochayn Alloys, Vol. 6) Moscow, 1960. 319 p. 3,000 copies printed.

Securing Agency Analysis and
Review. Meeting over problems
associated with the
operation of the
agency.

[illegible]

REMARKS: This book is intended for research workers in the field of physics of metals and for metallurgists, particularly those working on heat-treated alloys.

[illegible]

Overstines, A. D., L. D. Dehtyur, and L. M. Enck. Investigation of the
Resistence and Structure of Bone Iron-Iron Alloys, Depending on their
Composition

Ulrich, J. and V. L. Smythe. Effect of structure stability on
long distance

Smalley, L.L., L.L. Pyunina, and O.V. Chukhova. Effect of the Factor on the Character of the Plasma. 263

Two-Component System Ni-Cr - W - Ti - Al Alloys

204

Liferman, E. I., A. I. Kozlov, and V. P. Kravtsov. Investigation of Deformation and Failure of High-Alloy Steels. *Metallurgiya* 1968, 1969, and 1970.

books: Pu.A., S.O. Givhorich, I.Y. Gornovskiy, V. Ya. Bilyub, V. V. Burlov, M.P. Krasovskiy, and M.V. Anisimov. Casting Properties of Heat-Resistant Alloys

Miller, G. V., and A. B. MacIsaac, Investigation of the Fine Structure
 Defects in Heat-Treated Alloys

ATLANTA: LIBRARY of Congress

Abstract

1

Downloaded from <http://ajph.org/> on November 10, 2015

PHASE I BOOK EXPLOITATION

SOV/4344

Soveshchaniye po teorii liteynykh protsessov, 4th

Kristallizatsiya metallov; trudy soveshchaniya (Crystallization of Metals; Transactions of the Fourth Conference on the Theory of Casting Processes) Moscow, izd-vo AN SSSR, 1960. 325 p. 3,200 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut mashinovedeniya. Komissiya po tekhnologii mashinostroyeniya.

Resp. Ed.: B. B. Gulyayev, Doctor of Technical Sciences, Professor; Ed. of Publishing House: V. S. Rzhiznikov; Tech. Ed.: S. G. Tikhomirova.

PURPOSE: This book is intended for metallurgists and scientific workers. It may also be useful to technical personnel at foundries.

COVERAGE: The book contains the transactions of the Fourth Conference (1958) on the Theory of Casting Processes. [The previous 3 conferences dealt with hydrodynamics of molten metals (1955), solidification of metals (1956), and shrinkage processes in castings (1957)]. General problems in the crystallization of metals, including the crystallization of constructional steels,

Card 1/8

Crystallization of Metals (Cont.)

SOV/4344

alloy steels with special properties, cast iron, and of nonferrous alloys, are discussed. Recognition is given to D. K. Chernov and N. T. Gudtsov and their students, B. B. Gulyayev and A. G. Spasskiy, for their contributions to the understanding of the basic problems involved in the theory of crystallization of ferrous and nonferrous metals and alloys. Academician A. V. Shubnikov is also mentioned in connection with his work on the planning of research on crystal formation. References accompany several of the articles.

TABLE OF CONTENTS:

Foreword	
Gulyayev, B. B. Crystallization of Metals	3
I. GENERAL PROBLEMS IN THE CRYSTALLIZATION OF METALS	5
Lyubov, B. Ya. Calculation of the Rate of Crystallization of Metal in Large Volumes	35
Mirkin, I. L. Crystallization of Complex Alloys	43
Card 2/8	

KISLYAKOVA, Ye.N. [translator]; MIRKIN, I.L., red.; ~~BERLIN~~, Ye.N., red.
isd-va; DOBUZHINSKAYA, L.V., tekhn.red.

[Investigation of heat-resistant steels and alloys] Issledo-
vanie zharoprochnykh stalei i splavov. Pod red. I.L.Mirkina.
Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po chernoi i tsvetnoi
metallurgii, 1960. 352 p. (MIRA 13:4)
(Heat-resistant alloys--Testing) (Steel--Testing)

MIRKIN, I.L.; TSEYTLIN, V.Z.

Effect of constitutional equilibrium on heat resistance. Issl. po
zharopr. splay, 6:26^c-277 '60. (MIRA 13:9)
(Heat-resistant alloys) (Phase rule and equilibrium)

L 24685-65 EWT(m)/EWA(d)/EMP(t)/ENP(b) MJW/JD/WB
ACCESSION NR: APL049886

S/0096/64/000/012/0002/0005

AUTHORS: Kryarin, I. R. (Doctor of technical sciences, Professor); Mirkin, I. L. (Doctor of technical sciences, Professor); Trusov, L. P. (Candidate of technical sciences)

TITLE: Heat-resistant steels for heat power engineering

SOURCE: Teploenergetika, no. 12, 1964, 2-5

TOPIC TAGS: steam power plant, forging, turbine rotor, chromium, molybdenum, vanadium / R2 steel, R2M steel, EI756 high chromium steel, EP291 steel, EI257 austenitic steel, 15Kh1M1F steel

ABSTRACT: A review of the recommendations for promising types of steel to be used in steam power plants is presented. For coarse forgings for rotors with disk diameters up to 1100 mm, chrome-molybdenum-vanadium steels of the types R-2, R-2M, and EI-115 are recommended. For turbine casings and armatures, steel 15Kh1M1F may be used. This steel has a tensile strength on the order of 8 kg/mm². For turbine blades, high-chromium steels of the types EI-756, EI-802, EI-757, and EI-291 are recommended. These steels satisfy very well the requirements of high durability

Card 1/2

L 24685-65

ACCESSION NR: APL049886

combined with good corrosion resistance. The stress-rupture strength of these steels is about 15 - 16 kg/mm² at 580C, and about 12 - 13 kg/mm² at 600C. The following steels are recommended for mountings of details: EI-723 (0.22 - 0.30% C, 2.1 - 2.5% Cr, 0.9 - 1.1% Mo, and 0.3 - 0.5% V; the stress-rupture strength of this steel at 550C is 12 - 14 kg/mm²); EP-44 (0.20 - 0.30% C, 1.0 - 1.5% Cr, 0.8 - 1.1% Mo, 0.7 - 1.0% V, 0.1 - 0.2% Nb), and EP-182 (0.17 - 0.24% C, 0.9 - 1.4% Cr, 0.8 - 1.1% Mo, 0.7 - 1.0% V, and 0.05 - 0.12% Ti). For steam pipes, preheater pipes, and collector pipes, austenitic steels of the types EI-257 and 1Kh18N12T are suggested. For the construction and utilization of modern power units, it is necessary to use heat-resistant pearlite steels and high-chromium steels of the martensite and the martensite-ferrite type. Orig. art. has: 1 table.

ASSOCIATION: TONIITHASH

SUBMITTED: 00

ENCL: 00

SUB CODE: MM

NO REF SOV: 000

OTHER: 000

Card 2/2

S/137/62/000/006/092/163
A160/A101

AUTHORS: Mirkin, I. L., Krishtal, M. A.

TITLE: The thermal mobility of atoms in alloys

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 1, 1961, 1, abstract 6143
(In collection: "Issled. novykh zharoprochn. spлавov dlya energo-
tiki". Moscow, Mashgiz, 1961, 5 - 32)

TEXT: Review. Discussed are the mechanisms of diffusion: the diffusion of the pair exchange, along the vacancies, along the interstices, and the annular diffusion. The results of work carried out on the determination of concentration of vacancies by the methods of measuring the electric resistance of alloys and of the internal friction are presented. The effect of the volumetric factor on the diffusion of elements dissolved by the principle of interstitial atoms is considered. As regards the diffusion of H, N, C, and B, a linear dependence of the energy of activation on the atomic diameter of the element was detected in α -Fe. In the case of diffusion along the interstices, the valence of dissolved elements has a secondary importance. The diffusion of elements dissolved in

Part 1/2

The thermal stability of atoms in alloys

0/137/02/000/000/192/100
A100/A101

Pb and Ni by the principle of substitution is discussed in detail. The results of work on the investigation of simultaneous diffusion of several elements from the source are given. The effect of the structure on diffusion is investigated. The surface diffusion and the dependence of diffusion on crystallographic orientation are discussed. There are 47 references.

1. Letter v

Abstractor's note: Complete translation

Part 2

37971

S/137/62/000/005/073/150

A006/A101

AUTHORS: Mirkin, I. L., Tseytlin, V. Z., Morozova, G. G.

TITLE: Internal friction and shear modulus of some pure metals-components of heat-resistant alloys

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no. 5, 1961, 17, abstract 5111 (V sb. "Issled. novykh zharoprochn. splavov dlya energetiki", Moscow, Mashgiz, 1961, 34-48)

TEXT: The method of a torsion pendulum on an improved PKΦ-2 (RKF-2) device was used to study the temperature dependence of internal friction and G of pure metals: Ni (about 99.99%), Al (99.999%) and Mo (99.9%). The measurements were made on wire specimens of 0.8 mm in diameter and 300 mm length at 0.5 - 2 cps proper frequency of the torsional oscillations. On the curve, showing the temperature dependence of internal friction of pure Ni, 3 peaks were revealed: a) a "low-temperature" peak within a range of 100 - 200°C caused by ferromagnetic striction phenomena; b) a "medium-temperature" peak within the 300 - 400°C range, connected with the relaxation of stresses along the grain boundaries in viscous slip; c) a "high-temperature peak" within the 700 - 800°C

Card 1/3

Internal friction and shear modulus...

3/13/62/006/005/073/150
A006/A101

range observed during measurements of internal friction in the annealing process of strongly deformed Ni; the nature of this peak has not been as yet clarified. During the annealing process of strongly deformed Ni (to 90% and more), the internal friction level is noticeably reduced. An increase of the annealing temperature from 500 to 950°C raises the height of the "medium-temperature peak" of internal friction in Ni and only a further rise of the annealing temperature up to 1,200°C reduces the peak height. This is caused by the fact that intensive grain growth of deformed Ni proceeds at a temperature > 950°C, and the rise of the internal friction peak within 500 - 950°C is apparently connected with the disintegration of grains, which acquire a greater axial equality with higher annealing temperatures. The analogy observed in the course of the temperature dependence of G within the range from room temperature to the Curie point, is explained by the ferromagnetic striction phenomena. On the dependence curve of the internal-friction temperature of Al, only one internal friction peak was revealed in the range of 100 - 200°C, predetermined by stress relaxations along the grain boundaries. An increase in the grain size with higher annealing temperatures to sizes, commensurable with the sections of Al specimens, reduces regularly the height of the internal friction peak. On the temperature depend-

Card 2/3

S/137/62/006/005/073/151
AC06/A101

Internal friction and shear modulus ...

ence curve of the internal friction of pure Mo during heating to 900°C, peaks were not revealed. There are 8 references.

L. Gordiyenko

[Abstracter's note: Complete translation]

Card 3/3

S/137/62/000/006/095/163
A15C/A101

AUTHORS: Mirkin, I. L., Tseytlin, V. Z., Morozova, G. G.

TITLE: An investigation of the internal friction and the shear modulus of binary nickel alloys

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 6, 1962, 13, abstract 6175
(In collection: "Issled. novykh zharoprochn. spлавov dlya energo-
tiki". Moscow, Mashgiz, 1961, 49 - 60)

TEXT: Investigated was the magnitude of internal friction Q^{-1} and the square magnitude of the frequency of vibrations f^2 (proportional to the shear modulus) in relation to the test temperature for solid solutions of Ni-Cr, containing 0 - 26.9% Cr, and for Ni-Al alloys containing 0 - 7% Al. Ni-Cr alloys were vacuum smelted, and Ni-Al alloys in an atmosphere of argon and in air. The ingots were forged into rods with a diameter of 8 mm and were cold-drawn into wires with a diameter of 0.8 mm. Samples of the Ni-Cr alloy were annealed at 600°C for 3 hours, and samples of the Ni-Al alloys - at temperatures of 600 - 800°C. The tests were carried out at 20 - 950°C with the help of a РКФ - ММС

Card 1/2

Investigation of the...

S/137/62/000/006/095/163
A160/A161

(RPP-MIC) apparatus. Presented are the curves of Q^{-1} and f^2 of the alloys in relation to the temperature. A great effect of the content of Al and Cr in Ni on the temperature relations of Q^{-1} and f^2 was noted. The low-temperature peak of Q^{-1} shifted to lower temperature ranges and completely disappeared at 5% Al and 2.5% Cr. This is caused by losses of the magnetic properties of Ni when alloyed with Al and Cr. Also observed was a decrease or disappearance of the anomaly in the temperature dependence of the shear modulus during alloying, which was due to the ΔE -effect. The rise of the Q^{-1} curves and the high-temperature peak of internal friction shifted by 200 - 400°C to higher temperature ranges during alloying. This is explained by an increase of the bond strength in the solid solution lattice during alloying within the given limits.

A. Baranek

Abstracter's note: Complete translation.]

and 1/2

38905
S/590/61/101/000/006/015
D217/D305

18 9200
AUTHORS: Mirkin, I. L., Doctor of Technical Sciences. Professor
and Fantayeva, M. I., Engineer

TITLE: Some peculiarities of the kinetics of precipitation
and growth of Lawes-phase crystals in cast austenitic
steels

SOURCE: Moscow Tsentral'nyy nauchno-issledovatel'skiy insti-
tut tekhnologii i mashinostroyeniya [Trudy], v. 101,
1961 Issledovaniye novykh zharoprochnykh splavov
dlya energetiki, 111 - 119

TEXT: The properties of dispersion hardening refractory alloys
are determined largely by the type of hardening phases, the
degree of dispersion and the way in which they react with the ba-
sic solid solution; they are developed largely during precipita-
tion of the secondary stages from the solid solution. In this con-
nection, a study of the kinetics of precipitation and growth of
crystallites of the secondary phases, and of the changes in the

Card 1/5

28804
S/590/61/101/000/006/015
D217/D305

Some peculiarities of the .

structure and properties of the solid solution brought about by their precipitation was carried out. Two alloys (see Table 1) of approximately identical compositions, differing only in their Nb content (1 and 2.5 % respectively), were investigated. The microstructure of both alloys after water-quenching from 1200°C consists of a solid solution and coarse primary precipitates; the latter, according to X-ray analysis, are NbC and the Lawes phase (AB_2).

The X-ray structural analysis of the precipitates was carried out by R.N. Mogovaya, Yu.G. Sorokina and V.A. Smirnova, the chemical analysis by V.P. Kagarlitskaya and E.M. Zolotar at the Laboratory of X-ray Structural and Chemical Analysis TsNIITMASH under the supervision of S.A. Yuganova. In order to elucidate the peculiarities of the kinetics of precipitation and growth of crystallites of the Lawes phase, the influence of the tempering temperature in the range 850-1100°C and the period of ageing at 750°C (up to 3000 hours) on the change in the number and size of crystallites was studied. After each heat treatment, the number of crystallites of the secondary phase per 100 fields, each of $9 \cdot 10^{-5} \text{ cm}^2$ surface area,

Card 2/5

Some peculiarities of the ...

28885
S/590/61/101/000 106.015
D217/D705

(total surface = 0.9 cm^2), was counted. This enabled the degree of uniformity of distribution of the crystallites and their number per unit area to be assessed. The diameter of 250 - 600 particles was measured after each heat treatment. From the results obtained, distribution curves were plotted and the standard crystal diameters determined. It was found that: 1) The increase in the number of secondary Lawes phase crystallites increases on tempering the quenched metal up to 850-900°, and preferential growth of the crystallites continues up to 900-950°. The maximum number of crystallites in alloy B after 10 hours tempering was $1.5 \cdot 10^3 \text{ cm}^2$ of microsection area, and in alloy B2 $1.2 \cdot 10^3$. The maximum standard crystallite diameter in both alloys was similar, being 0.35-0.9 μ . 2) Intense precipitation of crystallites of the secondary Lawes phase takes place in the range 850-950°. 3) The intensity of precipitation of the secondary Lawes phase decreases somewhat on aging at 750° but in the range investigated did not result in a considerable growth of the secondary Lawes phase crystallites after 5000 hours. 4) An increase in the number of crystallites of the secondary phase, caused by increasing the tempering temperature or

Card 3/5

Some peculiarities of the ...

28885

S/590/61/10.1/100/006/015

D217.D85

the duration of ageing, is accompanied by an increase in the inhomogeneity of their distribution in the body of the metal: 1) During lengthy ageing at 450°, the W content of the secondary Lawes phase increases and the Fe content decreases somewhat. 6) The hardness of alloys strengthened by the Lawes phase depends on the number of crystallites per unit volume. The hardness increases abruptly with an increase in the number of crystallites up to 4000-5000/cm², and on a further increase in the latter, continues to rise at a considerably lower rate. There are 5 figures, 2 tables and 4 references: 3 Soviet-doc and 1 non-Soviet-doc. The reference to the English-language publication reads as follows: M. Hansen, Constitutions of Binary Alloys, New York, 1958.

Card 4/5

28885

S/590/61/101/000/006/015

D217/D305

Some peculiarities of the ...

Table 1. Chemical composition of the alloys investigated (%).

Legend: 1 - Name of alloy; 2 - B; 3 - B2.

Таблица 1

Химический состав исследованных сплавов в %

Обозначение сплава	C	Cr	Ni	W	Nb	Si	Mn	S	P
1									
2 Б	0,08	15,80	24,36	5,50	0,97	0,35	0,36	0,020	0,017
3 Б2	0,08	16,05	24,12	5,30	2,52	0,32	0,34	0,007	0,011

Card 5/5

18111

S/123/62/000/010/002/013
A004/A.01

181151

AUTHORS: Mirkin, I.L., Fanteyeva, M.I.

TITLE: Properties of cast austenitic alloys with intermetallic hardening

PERIODICAL: Referativnyy zhurnal, Mashinostroyeniye, no. 10, 1962, 19 abstract
10A112. (V sb. "Issled. novykh zharoprochn. splavov dlya energetiki".
Moscow, Mashgiz, 1961, 178 - 191)

TEXT: The authors present the results of investigating the short-term
(20 - 300°C) and long-life (700°C) strength of alloys of the Fe - 16Cr - 25Ni sys-
tem, alloyed with W, Nb, Mo, Ti and Al, subjected to intermetallic hardening. It
is pointed out that an alloying of the alloys Nb, Mo, Ti and Al does not show any
different results concerning the short-term strength and hardness of hardened
steels. The phases segregating during tempering cause a considerable increase
in strength. The long-life strength at 700°C of nearly all tested alloys is the
same, i.e., at 700°C for 10⁵ hours $\sim 100000 = 10 - 12 \text{ kg/mm}^2$. As to heat resist-
ance, the tested alloys approach the Ni-alloys "nimonix" 80 A and 3A607A (EI607A).

[Abstracter's note: Complete translation]

Card ./1

S/123/62/000/009/004/017
A052/A101

AUTHORS: Mirkin, I. L., Tereshkovich, A. S.

TITLE: The properties of cast austenitic steels with a carbide and mixed hardening

PERIODICAL: Referativnyy zhurnal, Mashinostroyeniye, no. 9, 1962, 20, abstract 9A125 (V sb. "Issled. novykh zharoprochn. splavov dlya energetiki". Moscow, Mashgiz, 1961, 192-204)

TITLE: The results are presented of the determination of hardness (HB), toughness and long-time strength of austenitic steels (20 - 25% Ni, 13 - 16% Cr) alloyed with W (2.6 - 6%), Ti (0.73 - 0.76%), Nb (0.89 - 1.06%) after continuous exposures to different temperatures (650 - 950°C) for securing the formation of two types of hardening phases, carbide and intermetallide one (of FeW₂ type). On the basis of the strength data obtained the conclusion is drawn that the promising alloys for a further development as material of cast turbine elements are alloys with a mixed type of hardening; such alloys have a high heat-resistance and a sufficient stability of the structure and properties.

[Abstracter's note: Complete translation]

Card 1/1

89670

18.8100 2808 1045 1418

S/129/61/000/002/001/014
E193/E483

AUTHORS: Mirkin, I.L., Doctor of Technical Sciences, Professor
and Tseytlin, V.Z., Candidate of Technical Sciences

TITLE: The Structural State and High-Temperature Strength of Alloys

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov,
1961, No.2, pp.2-11

TEXT: Based mainly on previously published works of both Soviet (including the present authors) and foreign researchers, this is an exposition of the present state of knowledge of the relationship between the high-temperature strength of alloys and various features of their structure and constitution. It is pointed out that at temperatures near the melting point, where diffusion processes play the predominant part and where quasi-viscous flow of the metal takes place, the chemical nature of the alloy which governs the strength of the atomic bonds of the alloy matrix is the main factor determining the resistance to deformation and fracture. However, at temperatures far below the melting point of the alloy its high-temperature strength depends mainly on its structural state: in the case of components operating under stress

Card 1/1

89670

S/129/61/000/002/001/014

E193/E483

The Structural State and High-Temperature Strength of Alloys

at high temperatures for long periods of time (up to several hundred thousand hours), the kinetic factor determining the ability of the alloy to retain its initial structural state plays also an important part. Alloys, in which processes of diffusion, coalescence and interaction between their constituents take place at a relatively slow rate, retain their high-temperature strength for a relatively longer time and are characterized by relatively slower rates of creep and relaxation. The initial structural state of an alloy depends on the composition and constitution of the solid solution matrix and other phases present and also on the distribution of these phases and interaction between them. The high-temperature strength can be imparted to a solid solution only by the introduction of alloying elements which increase the strength of the atomic bonds, slow down the rate of diffusion (particularly self-diffusion) processes, raise the recrystallization temperature of the solid solution and increase its resistance to shear. Introduction of several alloying elements (e.g. Mo, W, Cr, Co etc.) is more effective than a large addition of one element only.

Card 2/11

89670

S/129/61/00 /00/01/014
 10/1/6483

The structural state and high temperature strength of Alloys

If, however, the alloying additions are to perform their function, they have to be present in concentration higher than their solid solubility limit. This is illustrated on the example of a nickel-chromium alloy, containing 5% Mo - W and 3% Fe, whose relaxation stability at 700°C was increased twofold after its niobium content had been increased from 2 to 4%, the latter figure being higher than the solid solubility limit of niobium in this alloy. Another example is provided by the age-hardenable nickel-chromium alloys, containing aluminium and titanium. When solution-treated alloys of this type are tested at high temperatures, their strength remains relatively low until the beginning of the precipitation of a second phase, the rate of deformation in the initial stage of the test for solution-treated alloy being three times higher than that of age-hardened specimen. The results of experiments conducted in the laboratories with which the present authors are associated where a large number of Ni-Cr alloys and austenitic steels containing 8 to 40% Ni with some other alloying elements have been

Card 3/1

89670

S/129/61/000/002/001/014

8193/0485

The structural state and high-temperature strength of alloys

studied, have confirmed the view that satisfactory high-temperature strength is possessed only by heterogeneous alloys and steels, or by super-saturated solid solutions in which second phases can be precipitated at elevated temperatures. The importance of this factor is illustrated on the example of an Fe-base alloy containing 16% Cr and 32% Ni with and without Mo and W additions, present in various concentrations. The time-to-rupture at 700°C under the applied stress of 12 kg/mm² was determined for these alloys, the proportion of the precipitated phases (whose composition corresponded to the general formula $Me_{23}O_6$ and $Me_n Me_n^{n-1} O$) present in these alloys and separated by electrolytic dissolution of the specimens, was measured. The results are reproduced in Fig. 3, where $\sigma(t)$ is plotted against % of the insoluble residue representing the intermetallic compounds present in the alloys studied. At the same chemical and structural heterogeneity of a solid solution may adversely affect its resistance to plastic deformation. Thus, the high-temperature strength of austenitic

Card 4/11

07010

S/129/61/000/002/001/014
E193/E483

The Structural State and High-Temperature Strength of Alloys

(18Cr - 8 Ni) steels is considerably reduced in the presence of free ferrite. Precipitation of the ferromagnetic α -phase can also take place in a homogeneous steel, containing 14% Cr and 14% Ni, with the subsequent deterioration of the high-temperature strength and relaxation stability. All other factors being equal, the long-term high-temperature strength of an alloy at sufficiently high temperatures and low magnitude of applied stress increases with increasing grain size of the initial structure. This effect can be attributed to the fact established by Rachinger (Ref.7) who has found that at sufficiently high temperatures (higher than 250°C), 85% of total deformation of aluminium takes place along the grain boundaries, which means that with decreasing total grain-boundary area, the possibility of plastic deformation by movement of atoms in the grain-boundary regions decreases. The high-temperature properties of alloys are affected not only by the total area of the grain boundaries, but also by the nature of their structure. According to Mott (Ref.6), the lower the degree of lattice distortion of the grain boundaries and the stronger the

Card 5/11

89670

S/129/61/000/002/001/014

E193/E483

The Structural State and High-Temperature Strength of Alloys

atomic bonds of this lattice, the higher are the resistance of the grain boundaries to deformation, their high-temperature strength and, particularly, their plasticity. In the case of steels, the chemical nature of the precipitated phases is the factor governing their high-temperature properties. If the service temperature exceeds a certain critical level, it may be necessary to change the chemical composition and/or crystal lattice structure of these phases for the steel to retain its high-temperature strength. Thus, in materials designed to operate at 550 to 570°C, alloyed cementite plays the predominant part in imparting to steel its high strength, carbides of the alloying elements being of secondary importance. However, at higher temperatures, the iron-base carbides cannot ensure satisfactory high-temperature strength of the steel. At temperatures between 570 and 700°C, chromium carbides are the essential strength-imparting phases; they consist mainly of trigonal Me_7C_3 (at 580 to 600°C) and cubic $Me_{23}C_6$ (at 600 to 650°C) carbides. At temperatures higher than 750°C, the carbide phases are less effective in imparting the high-temperature strength

Card 6/11

S/129/61/000/002/001/014
E193/E483

The Structural State and High-Temperature Strength of Alloys

than other intermetallic compounds, and alloys based on metals other than iron have to be used in this temperature range. Thus, for instance, the predominant part in imparting the high-temperature strength to Ni-Cr alloys at 750 to 900°C is played by a phase of the $Ni_3(Al,Ti)$ type. In the next paragraphs, the authors discuss in greater detail the part played in steels by various alloying additions. They point out that in steels designed to operate at 300 to 350°C, the attainment of satisfactory strength can be ensured by the presence of unalloyed cementite alone. If the service temperature is raised to 400 to 450°C, chromium and/or molybdenum have to be introduced. These elements are present not only in the solid solution matrix but are capable of replacing some of the iron atoms in cementite; they increase the strength of the atomic bonds and inhibit diffusion processes which accelerate coalescence of carbides and may lead to decomposition of cementite and to the formation of free graphite. In this respect, steels containing both chromium and molybdenum are better than those containing one of these elements only, it having been found that

Card 7/11

89670

S/129/61/000/002/001/014

E193/E483

The Structural State and High-Temperature Strength of Alloys

free graphite can be precipitated after long periods at 500°C in a steel containing molybdenum alone. When molybdenum is the only alloying element, it diffuses slowly during service at elevated temperatures from ferrite to carbides, as a result of which the high-temperature strength of steel decreases. (It has been shown by Mirkin and Solonouts (Ref.13) that in the case of steel 15 M, operating at 500°C for 15000 to 25000 h, between a quarter and a half of molybdenum dissolved originally in ferrite has diffused into carbides.) At still higher temperatures it is necessary to ensure the formation of more complex carbides by addition of elements such as vanadium. These elements should be added in quantities sufficient for the formation of carbides not only of the Me_3C type, but also those corresponding to the formula MeC . It has been established that, in the case of pearlitic steels, better high-temperature strength is attained if the ferrite-carbide mixture is formed without the preliminary martensitic transformation. According to Bochvar (Ref.14), this effect can be attributed to the fact that in finely-granular pearlite formed as a result of

Card 8/11

09070

S/129/61/000/002/001/014

E193/E483

The Structural State and High-Temperature Strength of Alloys

decomposition of martensite, the number of regions that can simultaneously undergo plastic deformation is larger than that in lamellar pearlite. It has been established also, by Tseytlin (Ref.17), that a chromium-nickel-vanadium steel, tempered after air-hardening treatment, has better high-temperature strength than that tempered after normal hardening treatment, this effect having been attributed to a more favourable distribution of the alloying elements between ferrite and carbides attained by the former treatment. Apart from the initial structural state, the structural stability of the alloy at high temperatures is also very important. Thus, for instance, in the case of steel 12X12B4MØ (12Kh12V4MF), ageing for 3000 h at 600°C causes the formation of the $M_A(M_B)_2$ phase which, after 500 h at the temperature, becomes the predominant phase and brings about an increase in the rate of deformation (Ref.19). Similarly, the rate of deformation of an Fe-base alloy, containing 20% Cr, 20% Ni and 20% Co, decreased sharply after 6000 h at 600°C, owing to a corresponding decrease in the rate of precipitation of a carbide phase corresponding to a Card 9/11

89670.

S/129/61/000/002/001/014
E193/E483

✓

The Structural State and High-Temperature Strength of Alloys

general formula $Me_{23}C_6$. Finally, the high-temperature properties of alloys operating under conditions of prolonged loading depend to a large extent on the kinetics of phase transformations and, particularly, precipitation of second phases. In order to slow down these processes, it is desirable to slow down the rate of diffusion, particularly in alloys undergoing creep and relaxation. However, the coefficient of probability of concentration fluctuations is an equal, and often more important, factor. According to Mirkin (Ref.21), the fluctuation theory provides an explanation of the sharp decrease in the rate of precipitation of second phases, brought about by the introduction of several alloying additions and by increasing the difference between the composition of the matrix and the precipitated phases. Thus, for instance, when chromium-bearing carbide is being precipitated instead of unalloyed cementite, the number of carbide nuclei decreases by 2 to 4 orders of magnitude; when a ternary carbide is being precipitated, the number of these nuclei is decreased by several orders of magnitude. There are 11 figures and 21 references: 15 Soviet and 6 non-Soviet.

Card 10/11

89670

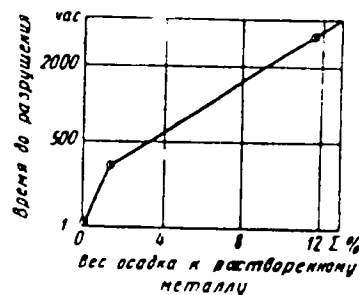
S/129/61/000/002/001/014

E193/E483

The Structural State and High-Temperature Strength of Alloys

ASSOCIATION: TsNIITMASH

Fig. 3.



Фиг. 3. Изменение времени до разрушения сплава с 16% Cr и 32% Ni (при переменном содержании Mo и W) в зависимости от увеличения веса электролитически выделенного осадка. Фазы выделения Me_2C_6 и Me_n , Me_n C, 700°, 12 кг/мм².

Card 11/11

0510
S/659/61/007/0 0/003/044
D217/D303

18.1151

AUTHORS: Mirkin, I.L., Fantayeva, M.I., and Tereshkovich, A.S.

TITLE: Influence of the type of strengthening phase on the properties of heat resistant alloys

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Issledovaniya po zharoprochnym splavam, v. 7, 1961, 200-28

TEXT: During 1958-59, an investigation of cast austenitic alloys based on 16 % Cr, 25 % Ni, 5. W, remainder Fe with various carbon contents, was carried out at TsNIITMASH. Various types of strengthening phases were produced by means of additional alloying, e.g. $Me_{23}C_6$, γ -phase, AB_2 . Certain other changes due to alloying with Ti, Al, Nb and Mo, do not bring about basic changes in the mechanical properties of the above solid solutions. In the quenched state, when the alloys consist of solid solutions with variable quantities of primary phase inclusions (TiC , TiN , NbC , AB_2), they possess a practically constant hardness and similar characteristics with respect to short-term fracture at 20°C. The different influences of

Card 1/1

X

Influence of the type of ...

S/659/61/50740 11/11/64
1217/D304

the alloying elements manifest themselves clearly only in impact tests, especially when the primary precipitates form a network. A change in alloy composition within the limits investigated does not greatly influence the properties of solid solutions, and, therefore, any change in properties may be considered due to the various strengthening phases, and can be estimated. A difference in the behavior of alloys manifests itself on raising the temperature of short-term fracture testing. The most intense weakening occurs in the case of alloys containing carbide strengtheners (carbide carbides of the $Me_{23}C_6$ type). Alloys containing a $Ni_3(Ti, Al)$ type strengthening phase resist the action of temperature best. The high-temperature resistance in long-term testing is due to the AB_2 phase which precipitates during creep tests. The AB_2 phase particles do not agglomerate. A particular characteristic of alloys strengthened by the AB_2 phase is their high plasticity in short-term as well as long-term tests at elevated temperatures. High-temperature resistant alloys should be strengthened by the precipitation of two phases at different stages of service: The rapidly precipitating phases $Me_{23}C_6$ and γ' and the slowly precipitating AB_2 . There are 6 figures.

Card 2/3

Influence of the type of ...

S/659/51/107/1 / 107/44
D217/D3 3

table and 5 references: 4 Soviet-bloc and 1 non-Soviet. The reference to the English-language publication reads as follows: W. J. H. Westbrook, Trans. Met. Soc. AIME October 1954.

C 10 4 4

X

S/O32/61/027/011/012/016
B104/B138

AUTHORS: Mirkin, I. L., Trusov, L. P., and Alekseyeva, N. A.

TITLE: A method of testing welded seams

PERIODICAL: Zavodskaya laboratoriya, v. 27, no. 11, 1961, 1392 - 1395

TEXT: The variable cross-section specimen shown in Fig. 1 is suggested for weld tests. This shape is to prevent the specimens from breaking outside the welded region during tests. The length of the cylindrical part of the specimen is varied according to the kind of welded seam. The local strain during the experiment was determined in sections I - V shown in Fig. 1. Tests with 18Kh12T (1Kh10N12T) steel showed that the shape of the specimen has no effect on the nature of the fracture and does not change the long-time strength substantially. The difference between the long-time strength determined with the specimen shape described here and that determined with the conventional shape is given as being 4 - 5%. Moreover, the specimens break in the centre of cylindrical region as desired. Consequently the possible effect of stress concentrations at the cone apex is small. Results are given in the table. There are 4 figures,

Card 1/8 2

MIRKIN, I.L., doktor tekhn.nauk, prof.; TSEYTLIN, V.Z., kand.tekhn.nauk;
MOROZOVA, G.G., inzh.

Investigating the aging process in nickel alloys by changes
in the temperature relation of internal friction. [Trudy]
TSNIITMASH 101:61-79 '61. (MIRA 14:10)
(Nickel alloys--Metallography)
(Internal friction)

MIRKIN, I.L., doktor tekhn.nauk, prof.; YUGANOVA, S.A., kand.fiz.-matem.nauk;
SOROKINA, Yu.G., inzh.

Kinetic peculiarities of the aging of nickel-base alloys.
Metaloved. i term. obr. met. no.7:14-20 JI '61. (MIRA 15:6)

1. Tsentral'nyy nauchno-issledovatel'skiy institut tekhnologii
i mashinostroyeniya.

(Nickel alloys--Hardening)

40976

S/659/62/009/000/006/030
1003/1203

AUTHORS Gertsriken, S. D., Slastnikova, L. F., Yatsenko, T. K., Volkova, T. I., and Mirkin, I. L.
TITLE The relationship regularities in the diffusion of nickel in nickel-base alloys and the refractory properties of these alloys

SOURCE Akademiya nauk SSSR Institut metallurgii Issledovaniya po zharoprochnym splavam
v 9 1962 Materialy Nauchnoy sessii po zharoprochnym splavam (1961 g.), 42-46

TEXT Data on the mobility of atoms at elevated temperatures are necessary for the investigation of heat resistant alloys. Such data were obtained here for different grades of nickel and of nickel-base alloys containing Cr, W, Mo and Co. A layer of radioactive Ni^{63} was electrolytically deposited on polished samples, which were heated to a temperature range from 970°C to 1170°C. The diffusion coefficient of nickel was calculated from the difference in the radioactivity of the surface before and after heating. The self-diffusion coefficients were calculated for refined nickel $D = 0.36 \exp(-64700/RT)$ cm²/sec. for commercial nickel $D = 0.25 \exp(-63006/RT)$ cm²/sec. Diffusion coefficients of nickel into both refined and commercial grade alloys were calculated, and the mechanical properties as well as the melting points of the alloys were determined. The conclusion reached are that the long-time strength and the resistance to relaxation of nickel-base alloys

Card 1/2

The relationship between regularities in the

S/659/62/009/000/006 030

1003/1203

at 800°C is due chiefly to the structure and to the dislocations in the alloy and that the thermal mobility of atoms of the chief components is of lesser importance. In the discussion, E. M. Pivnik expressed the opinion that the relationship between the diffusion in nickel base alloys and their heat resistance may be more complex than suggested by the authors while A. Ya. Shinyaev believed that may be premature to draw conclusions on the relationship between the heat resistance of alloys and the diffusion at low temperatures. There are 2 figures and 2 tables.

Card 2/2

S/590/62/105/000/001/015
1031/1242

AUTHOR: Mirkin, I.L., Dr. of Technical Sciences, Prof.

TITLE: Intermetallic phases in Fe-Ni alloys

SOURCE: Moscow. Tsentral'nyy nauchno-issledovatel'skiy
institut tekhnologii i mashinostroyeniya. Trudy,
v. 105, 1962, 5-11

TEXT: Precipitation-hardening of austenitic steels with
certain intermetallic phases, especially those of the KhI type,
has not been sufficiently studied. Considerable attention is paid
to precipitation-hardening with the AB_2 phase (Laves-phase) whose
A group is composed of age-hardening elements W, Mo, Nb, or Ti and
B groups of Fe, Cr, or Ni. These phases have a close-packed hexa-

Card 1/3

S/590,62/105/000/001/015
I031/I242

Intermetallic phases in Fe-Ni alloys

ronal structure, and are formed with elements whose atomic radius ratio $\frac{r_A}{r_B} = 1.11-1.33$. The A group of the primary AB₂ phase (stable above 1200°C) is composed mainly of niobium, the B group of iron. In the secondary AB₂ phase which precipitates upon prolonged aging, the A group is composed mainly of W. The hardness of the AB₂ phase (VHN 900) is considerably higher than that of the matrix (VHN 140-160). The AB₂ phase is formed very slowly in a wide range of alloys with a low content of A-group elements. Metallographic inspection showed that intense quantitative growth of the AB₂ phase takes place on heating for 3000 hours, while the rate of coagulation of particles during prolonged aging at 750°C is remarkably slow. This unusual behavior is due mainly to the extremely slight possibility of fluctuation in the concentration of elements necessary for balanced nucleation. The concentration ratio of elements in the preci-

Card 2/3

S/590/62,105/000/001/015
I031/I242

Intermetallic phases in Fe-Ni alloys

precipitating AB_2 phase to those in the solid solution is $\frac{2}{3}$ for Cr, $\frac{1}{3}$ for Ni, $\frac{4}{1}$ for V, and $\frac{7}{1}$ for Nb. Therefore, the migration rate of atoms from and into the matrix is extremely slow. Complex and time-consuming changes in the crystal structure have also delaying effects on the precipitation behavior. There are 5 figures and 1 table.

1

Card 3/3

MIRKIN, I.L., doktor tekhn.nauk, prof.; PETROPAVLOVSKAYA, Z.N., kand.tekhn.
nauk

Dependence of the stress relaxation process in steel on the
degree of ferrite alloying. [Trudy] TSNIITMASH 105:12-29 '62.
(MIRA 15:8)
(Steel alloys—Metallography) (Strains and stresses)

S/590/62/105/000/002/015
1031/1242

AUTHOR: Litvin, L.L., Prof., Dr. of Technical Sciences, and
Pantayeva, M.I., Eng.

TITLE: Volume changes in cast austenitic alloys on tempering

SOURCE: Moscow. Tsentral'nyy nauchno-issledovatel'skiy institut
tekhnologii i mashinostroyeniya. Trudy, v.105, 1962,
30-35

TEXT: The article deals with volumetric changes which take place in austenitic steels during precipitation of FeW and Ni₃ (Ti, Al) phases (Laves and gamma phase, respectively) from solid solution. Change of volume was determined by difference in density of hardened and tempered specimens. The volume decreased during the tempering process, regardless of composition of the precipitated phase. Precipitation of Laves phases had little effect, while precipitation of gamma phases was accompanied by a considerable change of volumetric. The greatest density of metal containing a Laves phase, corresponds

Card 1/2

S/590/62/105/000/002/015
I031, I242

Volume changes in cast...

to the tempering range 450-500°C. For alloys with gamma phase, the optimal temperature is 600°C. Volumetric changes are due either to change in the distance between atoms in the packed structure during their migration from a solid solution to a new phase, or to coherence between the solid solution and the precipitating phase. Very little difference was found between close packing in the gamma phase and in the solid solutions Ni-Ti and Ti-Al. Volume changes in alloys containing the gamma phase are due to the development of coherent bond between this phase and the solid solution during the initial stage of precipitation. Volumetric changes do not affect the hardness of alloys. There are 3 figures and 1 table.

Card 2/ 2

GERTSRIKEN, S.D. [deceased]; SLASTNIKOVA, L.F.; YATSENKO, T.K.; VOLKOVA, T.I.;
MIRKIN, I.L.

Regularities of nickel diffusion in nickel-base alloys compared with
the heat resistance properties of these alloys. Issl. po zharopr.
splav. 9:42-46 '62. (MIRA 16:6)
(Nickel alloys—Thermal properties) (Diffusion)

S/590/62/105/000/005/015
1031/1242

AUTHORS: Mirkin, I.L., Prof., Dr. of Technical Sciences, and
Tpusov, L.F., Candidate of Technical Sciences

TITLE: Performance of welded joints in steam pipe-lines made of
austenitic steels

SOURCE: Moscow. Tsentral'nyy nauchno-issledovatel'skiy institut
tekhnologii i mashinostroyeniya. Trudy, v.105, 1962,
57-61

TEXT: The design of steam pipe-lines is generally based on creep
strength and endurance limit of the pipe metals and welds. A con-
siderable number of failures occurred in welded joints of steam
pains made of 1X14H14B2M (EI257) (1 Kh 14N 14V 2M EI257) and
1X18H12T (1 Kh 18N 12T) austenitic steels after only 700-800 hrs of
operation. The tensile strength of regular and welded specimens of
EI257 steel was 14 kg/mm² at 580°C after 50 000 hrs. In the case
of the 1Kh18H12T steel the values at 610°C were 12.5-13.5 kg/mm²

Card 1/2

S/590/62/105/000/005/015
I031/I242

Performance of welded joints...

and 11 kg/mm² for regular and welded specimens, respectively. The safety factor was 2.3-3.2. The failures are due partly to high complex working stresses brought about by sharp changes in steam temperature, and partly to insufficient plastic deformation of the welds. Thus, the present design of high-pressure steam lines and welded joints, do not fully reflect the actual operating conditions. There are 2 figures and 1 table. /

Card 2/2

S/590/62/105/000/009/015
1031/1242

AUTHORS: Mirkin, I.L., Dr. of Technical Sciences, Volkova, T.I.,
Candidate of Technical Sciences, and Blanter, M.S., Eng.

TITLE: Effect of vacuum melting on heat-resistant properties
of iron alloys

SOURCE: Moscow. Tsentral'nyy nauchno-issledovatel'skiy institut
tehnologii i mashinostroyeniya. Trudy. v.105, 1962,
125-134

TEXT: The present work was carried out because of the absence of
information on the influence of vacuum melting on relaxation and
creep behavior in high-temperature alloys. Four grades of iron-
base steels were investigated: pure iron; non-hardenable single
phase Fe-Cr-Ni steel; slow aging alloy with Mo and W added, and an
alloy highly susceptible to aging, with Mo, W, Ti, Al and Nb added.
Melting was performed in an induction furnace at a pressure of
 1.10^{-4} - 5.10^{-5} mm Hg. Short-term mechanical properties, stress-

Card 1/2

S/590/62/105/000/009/015
I031/1242

Effect of vacuum melting...

rupture strength, relaxation, and creep resistance were tested. As a result of vacuum melting relaxation and creep resistance increased with increasing complexity of the chemical and phase composition of steel. High-alloy steels gain stress-rupture strength and lose ductibility, while vacuum melting of low-alloys improves their ductility to some extent but does not influence a long-term strength behavior. Optimal heat-resistant properties may be gained by applying vacuum melting and pouring with alloys of more complex chemical and phase composition than that suggested for conventional melting. There are 5 figures and 5 tables.

Card 2/2

L 16569-65 EWT(m)/EWP(w)/EWA(d)/T/EWP(t)/EWP(b) SSD/AFWL/ASD(m)-3/IJP(c)
HJW/JD

ACCESSION NR: AR4045889

S/0137/64/000/007/I037/I037

SOURCE: Ref. zh. Metallurgiya, Abs. 7I231

AUTHOR: Mirkin, I. L.; Endzelin, M. A. B

TITLE: The effect of boron on the internal friction of
1Kh18N12T steel 27 16

CITED SOURCE: Sb. Relaksats. yavleniya v met. i splavakh. M.,
Metallurgizdat, 1963, 229-232

TOPIC TAGS: boron, internal friction, steel, austenitic steel, alloy

TRANSLATION: The effect of boron additives (0.01 and 0.03%) on the magnitude and nature of the temperature dependence of the internal friction of austenitic 1Kh18N12T steel quenched from 1075° and aged at 700° for 1000 hrs was investigated. Internal friction was measured by a high frequency method on a UIMD-1 apparatus with transverse vibrations of a frequency of approximately 1 kc on samples 8 mm in diameter and 200 mm long. The temperature dependence curve of internal friction has a small peak at about 100°. The right

Card 1/2

L 16569-65

ACCESSION NR: AR4045889

branch of the internal friction peak changes into the horizontal section of the curve located in the 350-500° region, which then changes to the high temperature rise. The internal friction peak is related to the presence of a certain amount of alpha-phase in the steel under investigation. Introduction of B in an amount up to 3% does not show any significant effect on the nature or the level of the internal friction curve up to 500°. However, the high temperature branches of the internal friction curve for steel with B are lower than for steel without B. Addition of B displaces the temperature of the start of the rise of the internal friction curve in the direction of the higher temperatures. The degree of effect of B on internal friction and modulus of elasticity with an increase in temperature does not change with a B content in the steel of 0.01%, but rises sharply at 0.03%.

SUB CODE: MM, AS

ENCL: 00

Card 2/2

L 12894-63

BDS/EWP(q)/EWT(m)

AFPTG/ASD

JD/HM

ACCESSION NR: AP3000678

S/0096/63/000/006/0710/0015

AUTHOR: Kryanin, I. R. (Doctor of technical sciences, Professor); Mirkin, I. L. (Doctor of technical sciences, Professor); Trusov, L. P. (Candidate of technical sciences)

TITLE: Steel used in stationary steam power plants operating at high ultra-high pressures and temperatures

SOURCE: Teploenergetika, no. 6, 1963, 10-15

TOPIC TAGS: power plant, steam pipe, welding, steel type, 12Kh1MF steel, 15Kh1MF steel, EI-756 steel

ABSTRACT: A study of characteristics and manufacture of steels 12Kh1MF, 15Kh1MF, and EI-756 (12Kh11V2MF) for use in 200-, 300-, 500-, and 800-Mwt power plants operating at 170 abs. atm. and 570C or at 255 abs. atm. and 585C was made at Tsentral'nyy nauchno-issledovatel'skiy institut tekhnologii i mashinostroyeniya (Central Scientific Research Institute of Technology and Machinery). The limit of strength in forged and perforated pipes of steel 15Kh1MF, with a wall thickness of 45-85 mm was found to be 9-10 kg/Sq mm at 585C. It was 8-9 kg/Sq mm for welded pipe joints. The test of original and welded parts indicated a high plasticity.

Card 1/32

L 12894-63

ACCESSION NR: AP3000678

2

This perlite steel is recommended for production of steam pipes in 300-Mwt plants operating at 585C and 255 abs. atm. Table 1 (see enclosure) shows allowable and ultimate stresses for both steels at a temperature range of 520-600C. Electrode Tsl-34 is recommended for welding this material with a preheating temperature of 300-350C. The use of thick pipes made of steel 12Kh1MF for the same power plants is not recommended because of the low limit of sustained strength in this steel. Experiments on pipes of chromium-molybdenum-vanadium steel with additional ingredients will be finished in 1963. Martensite-ferrite steel EI-756 and electrodes Tsl-32 are recommended for pipes in power plants operating at 585-630C. Bisectional induction coils of both rigid and flexible types are recommended for local heating in welding straight and curved pipes. Orig. art. has: 7 figures and 4 tables.

ASSOCIATION: TsNIITMASH

SUBMITTED: 00

DATE ACQ: 21Jun63

ENCL: 01

SUB CODE: 00

NO REF SOV: 003

OTHER: 000

Card 2/3

L 14268-63

ACCESSION NR: AP3002857

BWP(q)/EWT(m)/BDS

AFFTC/ASD

JD/JG

8/0126/63/015/006/0943/0944 99
60

AUTHOR: Mirkin, I. L.; Yudin, A. A.

TITLE: The Third All-Union Scientific Conference on Relaxation Phenomena in Metals and Alloys [held in Voronezh from 9 to 13 October 1962]

SOURCE: Fizika metallov i metallovedeniye, v. 15, no. 6, 1963, 943-944

TOPIC TAGS: metal internal friction, alloy internal friction, molybdenum mono-crystal internal friction, tungsten internal friction, iron-molybdenum alloy internal friction, metal relaxation, alloy relaxation, amplitude-dependent internal friction, lattice defects

ABSTRACT: The Third All-Union Scientific Conference on Relaxation Phenomena in Metals and Alloys was held in Voronezh in October, 1962. The majority of the 60 reports presented dealt with the investigation of various physical phenomena by means of the internal friction method and the explanation of the phenomena from the viewpoint of the theory of microdefects in the crystal lattice. L. N. Aleksandrov (Saransk) reported on the effect of lattice defects on the internal friction in tungsten and molybdenum during recrystallization. It was established

Card 1/3

L 14268-63

ACCESSION NR: AP3002857

22

that the behavior of internal friction during recrystallization is related to stress relaxation at the grain boundaries induced by migration of the atoms of impurities and of the metal. The reports of V. P. Yelyutin, A. K. Natanson, Ye. I. Mozzhukhin, and O. A. Vasil'yev (Moscow) dealt with internal friction in tungsten. By applying the method of internal friction and using the theories of V. T. Shmatov and A. V. Grin, M. A. Krihtal, S. A. Golovin, and A. P. Mokrov (Tula) evaluated the concentration of vacancies in coarse-grained FeMo alloys and its dependence upon the molybdenum content. P. L. Gruzin and A. N. Semenikhin (Moscow) studied the internal friction in single crystals of annealed and deformed molybdenum. The study clarified the role of point defects and dislocations in relaxation phenomena. I. L. Mirkin and M. A. Endzelin (Moscow) investigated the effect of small additions of boron on the behavior of grain boundaries in the 1Kh18N12T [AISI 317T] stainless steel and pointed out that boron lowers internal friction at grain boundaries, especially at higher temperatures. In their study of internal friction in iron subjected to thermomagnetic and combined thermomechanical and magnetic treatments, Yu. V. Piguzov and M. L. Bernshteyn (Moscow) discovered that, besides peaks at 40 and 200C, there is a dislocation-induced peak at -50C, which is related to migration of dislocations. In contrast, the peak at 200C is related to interaction between dislocations and interstitial atoms.

Card 2/3

27

L 14268-63

ACCESSION NR: APJ002857

18

V. S. Postnikov and G. A. Gorbukov (Voronezh) studied the restoration of internal friction in aluminum after cyclic deformation at stresses higher and lower than fatigue strength. Their findings provided additional information on the mechanism of fatigue fracture. V. S. Postnikov and I. V. Zolotukhin (Voronezh) investigated the effect of thermal cycles on the internal friction in Al-Zn and Al-Cu alloys. A number of reports dealt with the magnetic component of internal friction in ferromagnetics. Other reports discussed methods of measuring internal friction. A. N. Aleksandrov and V. S. Mordyuk (Saratov) reported on a vacuum torsional-relaxation unit with direct heating, which permits the investigation of refractory metal wires at temperatures up to 3000C. I. A. Azizov, K. V. Popov, and V. F. Vinogradov (Irkutsk) designed a unit for measuring internal friction in standard creep-test specimens. G. P. Yakovlev (Sverdlovsk) reported on an electronic device for the rapid and precise determination of the attenuation decrement at a frequency of 10^{-1} — 10^{-2} cps. G. A. Vedenyapin (Moscow) discussed an electron oscillograph with afterglow for recording vibrations.

ASSOCIATION: none

SUBMITTED: 00

DATE ACQ: 23Jul63

ENCL: 00

SUB CODE: ML

NO REF SOV: 000

OTHER: 000

Card 3/3.

MIRKIN, I. I.

"Structure Research Problems Put Forward by Technical Progress Demands."

report presented at the 3rd Conference of Higher Educational Institutes on Strength and Plasticity of Metals, Petrozavodsk State University, 24 June - 29 June 1963.

ACCESSION NR: AT4013932

S/2659/63/010/000/0087/0092

AUTHOR: Dekhtyar, I. Ya.; Mirkin, I. L.; Mikhalekov, V. S.; Fedchenko, R. G.; Volkova, T. I.; Blanter, M. S.

TITLE: Investigation of the paramagnetic properties of high temperature alloys on an iron and nickel base

SOURCE: AN SSSR. Institut metallurgii. Issledovaniya po zharoprochn*m splavam, v. 10, 1963, 87-92

TOPIC TAGS: paramagnetic steel, high temperature alloy, iron alloy, nickel alloy, chromium alloy, alloy paramagnetic property, paramagnetism

ABSTRACT: The temperature dependence of the paramagnetic properties of high temperature alloys on an iron and nickel base was investigated as a guide to their electronic structure and the effective number of electrons N . It was found that the maximum number of electrons for nickel-chromium alloys is found in those containing 10% Cr. Addition of niobium to an alloy of Ni + 16% Cr leads to significant increase in N . Investigation of complex alloys on a nickel-chromium base showed that the maximum N is observed in alloys with aluminum and titanium. Investigation of complex alloys on an iron-nickel-chromium base showed

Card 1/2

ACCESSION NR: AT4013932

that the effective magnetic moment connected with N is maximal in alloys containing tungsten and molybdenum, while niobium, titanium and aluminum lead to a decrease in N. The results obtained and their comparison with tensile strength studies show that the number of electrons in the bond found on the basis of the temperature dependence of paramagnetic sensitivity may characterize the strength of the interatomic bonds at high temperatures. Orig. art. has: 3 figures, 2 tables and 9 formulas.

ASSOCIATION: Institut metallurgii AN SSSR (Metallurgical Institute AN SSSR)

SUBMITTED: 00

DATE ACQ: 27Feb64

ENCL: 00

SUB CODE: ML

NO REF SOV: 002

OTHER: 000

Card 2/2

MIRKIN L

11

by Z. G. Pinsker ("Basis of diffractive methods of investigation of perfect crystals"), B. M. Rovinskiy and L. M. Rybakova ("Investigation of dependence of mechanical properties on characteristics of structure of metals"), L. M. Utevskiy and P. M. Usikov ("Application of microscopy in investigation of structure of alloys"), A. A. Predvoditelev and N. A. Tyapunina ("Role of reproduction of dislocations in process of plastic flow"), A. V. Pertsov, N. V. Pertsov and E. D. Shukin "Self-producing internal dispersion of metals under action of strongly superficially-active metallic melting" and I. L. Mirkin ("Problems of structural investigations, advanced by requirements of progress of technology").

reports presented at the 3rd Intervuz Conference on Strength and Ductility of Metals, Petrozavodsk State University, 24-29 June 1963.

(reported in Fizika Metallov i Metallovedeniye, Vol. 16, No. 4, 1963, p 610.

JPRS 24,651 19 May 1964.

EEIN
ACCESSION NR: AT4013941

S/2659/63/010/000/0149/0156

AUTHOR: Mirkin, I. L.; Zaletayeva, R. P.; Tereshkovich, A. S.

TITLE: Phase composition and properties of complex-alloyed austenitic steels

SOURCE: AN SSSR. Institut metallurgii. Issledovaniya po zharoprochnym splavam, v. 10, 1963, 149-156

TOPIC TAGS: steel, austenite steel, complex alloyed austenite steel, alloy steel phase composition, alloy steel physical property, heat resistant steel

ABSTRACT: The austenitic heat-resistant steels used at the present time contain, as a rule, small quantities (up to 0.15%) of carbon. The most frequently used alloying elements are titanium, niobium and aluminum (up to 1%), and molybdenum and tungsten (2-3%). This article discusses the results of a study of two groups of austenitic steels with a basis of Fe + 16% Cr + 25% Ni plus a C content of either 0.25-0.30%, alloyed with 3-9% W, or up to 0.10% C, alloyed with an increased quantity of aluminum (up to 5%). All the investigations were made on cast metal after tempering from 1200C and drawing at 800C for 10 hours. The change in the phase composition of the alloys was determined by roentgenography. The results of a roentgenostructural analysis of electrolytically separated precipitations are discussed. The hypothesis is advanced that the solubility of tungsten in the solid
Card 1/3

FE 4

ACCESSION NR: AT4013941

solution of such alloys is lower than in similar alloys without manganese, and that the formation of the intermetallide Fe_2W , containing a large amount of tungsten, will be facilitated. As the tungsten content increased, there was an increase in the strength properties at normal and high temperatures, and a decrease in plastic characteristics and impact ductility. It was found, with reference to this first group of austenitic steels, that there is a change in the phase composition both in the initial state (the appearance, in addition to carbide $Me_{23}C_6$ of double carbide $M'_nM''_nC$) as well as with aging (the earlier occurrence of the intermetallide AB_2). For the second group, the authors investigated the effect of aluminum on the process of the formation of intermetallide phases in austenitic steel of the following composition: 0.10% C, 14-16% Cr, 25-30% Ni. The aluminum concentration in the alloys varied from 1.5 to 5%. A study was made of the hardness, microstructure, mechanical properties and phase composition after tempering in a temperature range of 900-1300C. A magnetic analysis was also made which showed that the intermetallide Ni_3Al in steels with 1.5 and 3% Al has extremely low magnetic properties. In conclusion it was found that: 1) a change in the aluminum content in steel containing 15% Cr, 30% Ni and 50-55% Fe is accompanied by the formation of various types of strengthening phases. In a steel alloy containing up to 3% Al, the basic strengthening phase is γ (Ni_3Al), while in a 5% Al concentration, the excess phase is a complex intermetallide compound which is, apparently, a solid solution of $NiAl$ and $FeAl$; 2) this phase ($NiAl$, $FeAl$) per se,

Card 2/3

ACCESSION NR: AT4013941

and also the steel in which it is the leading strengthening phase, differs substantially in its properties from steels containing up to 3% aluminum; 3) the specific properties of this phase call for the further investigation of high-aluminum steels in the development of new compositions of heat-resistant austenitic steels. "Changes in the phase composition during prolonged storage of the alloys at 750C were determined roentgenographically by Engineer M. O. Nesterova." Orig. art. has: 4 tables and 4 graphs.

ASSOCIATION: TsNIITMASH (Central Scientific Research Institute of Machinery)

SUBMITTED: 00

DATE ACQ: 27Feb64

ENCL: 00

SUB CODE: ML

NO REF SOV: 002

OTHER: 002

Card 3/3

L 8668-65 RWT(m)/RWT(p) ASD(d)/ASD(c)-2/ASDTR/ESD(dp)/AFMOC/AFM/SSD/ASD(m)-3/
 RAEM(a)/RAEM(e) JD
 ACCESSION NR: AP4044131 8/0129/64/000/008/0001/0005

AUTHOR: Mirkin, I. L., Petropavlovskaya, Z. N.

TITLE: The effect of ferrite composition on the relaxation resistance of chromium steel

SOURCE: Metallovedeniye i termicheskaya obrabotka metallov, no. 8, 1964, 1-8, and insert facing p. 24

TOPIC TAGS: steel, chromium steel, ferrite, ferrite composition, relaxation resistance, stress relaxation, hardness, stainless steel

ABSTRACT: Stress relaxation was studied in samples of Cr-Mo-V steel at 525-565C after normalization from 1050-1100C and tempering at 700C, in an attempt to establish a relationship between relaxation-resistance and ferrite composition. The steel samples, having a ferrite structure, contained 0.04-0.06% C, 1.14-10.03% Cr, 0.58-0.68% Mo, 0.16-0.27% V, with slightly lower amounts of the elements in the ferrite phase. The study included: a. measuring the bonding forces in the lattice of α -iron from the characteristic temperature, b. investigating recrystallization in deformed metal by measuring ferrite microhardness after cold working with subsequent heating (as shown in Fig. 1 of the Enclosure), and c. determining the recrystallization temperature from hardness curves after tempering. The results indicate that a sufficiently low rate of diffusion linked with Card 1/4

L 8668-65

ACCESSION NR: AP4044131

2
chromium alloying is a necessary condition for high relaxation resistance in this type of steel. The highest relaxation resistance, as indicated in Fig. 2 of the Enclosure, is shown by a steel whose ferrite contains 0.5% Mo, 0.1% V and 1.0 or 10.0% Cr. "G.P. Kushta directed the determination of the characteristic temperature at the Chernovitsky gosudarstvennyy universitet (Chernovtsy State University)." Orig. art. has: 4 figures and 1 table.

ASSOCIATION: TsNIITMASh

SUBMITTED: 00

ENCL: 02

SUB CODE: MM

NO REF SOV: 000

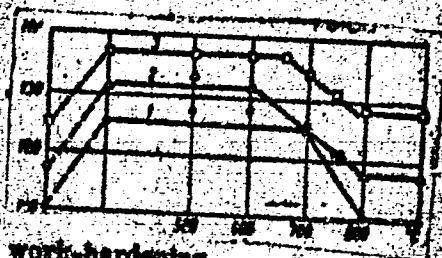
OTHER: 000

Card 2/4

L 8668-65

ACCESSION NR: AP4044181

ENCLOSURE: 01



Annealing, work-hardening
Temperature of heating

Fig. 1. Microhardness of ferrite vs temperature of heating after cold working. Ferrite composition:

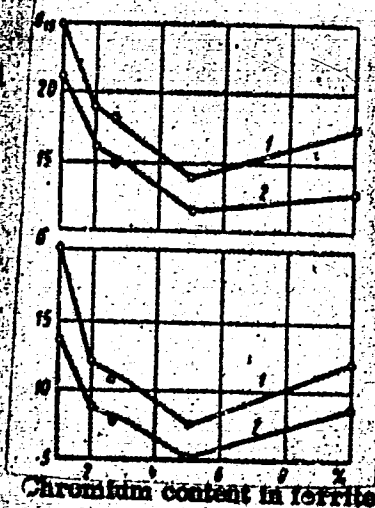
1—1% Cr, 0.5% Mo, 0.1% V; 2—2% Cr, 0.5% Mo, 0.1% V; 3—5% Cr, 0.5% Mo, 0.1% V; 4—10% Cr, 0.5% Mo, 0.1% V.

Card 3/4

L 8665-6;
ACCESSION NR: AP4044181

Residual

Resi
dual
stress



ENCLOSURE: 02

Fig. 2. 15- and 2000-hrs. relaxation resistance at 525 (1) and 565°C (2) of ferrite with 0.5% Mo and 0.1% V vs chromium content.

Card 4/4

KRYANIN, I.R., doktor tekhn. nauk, prof.; MIRKIN, I.L., doktor tekhn. nauk,
prof.; TRUSOV, L.P., kand. tekhn. nauk

Heat-resistant steels for thermal power engineering. Teplo-
energetika 11 no.12:2-5 D '64 (MIRA 18:2)

1. Tsentral'nyy nauchno-issledovatel'skiy institut tekhnologii
i mashinostroyeniya.

L 3669-66 EWT(m)/EWP(w)/EWA(d)/T/EWP(t)/EWP(z)/EWP(b) LJP(c) MJW/JD/JG

ACCESSION NR: AP5010375

UR/0145/65/000/003/0119/0124
669.181

AUTHORS: Mirkin, I. L. (Doctor of technical sciences, Professor); Trusov, L. P.
(Candidate of technical sciences)

TITLE: New highly heat resistant perlitic steels for power plant construction

SOURCE: IVUZ. Mashinostroyeniye, no. 3, 1965, 119-124

TOPIC TAGS: perlitic steel, chrome alloy, molybdenum alloy, vanadium alloy,
low alloy steel / 15Kh1MIF steel, 25 Kh2MIFB steel

ABSTRACT: ¹⁶Low alloy steels (less than 4% alloys) must be used to make large power plants now under design (500 000-800 000 kw operating at live steam temperature of 565C or up to 585C) economically practical. Research and practical experience have shown that chrome-molybdenum-vanadium perlitic steels are most proper for operation at such temperatures. Steel 15Kh1MIF (0.2% C, 1.5% Cr, 1.0% Mo and 0.3% V) is now basic for most turbine parts, while the C content is lowered to 0.1-0.15% in steam pipes. Creep strength tests of above 25 000 hours indicate that extrapolated values to 10^5 hours of operation at 585C should be 8-9 kg/mm² for 15Kh1MIF and 9-11 kg/mm² for the steam pipe modified alloy. It is noted

Card 1/2

L 3669-66

ACCESSION NR: AP5010375

2

that a simple increase in alloy content does not result in improved properties, as shown by Cr-Mo-V steels in which increasing the Cr content from 1.0 to 3.0% decreased the yield strength from 63-50 kg/mm² and $\sigma_{0.2}$ from 53 to 47 kg/mm². The relaxation strength (at the same initial stresses) is found to be 1.5-2 times higher at temperatures of 565-580C for steels containing less Cr and Nb and more V (1.0-1.5% Cr, 0.7-1.0% V) than steel 25Kh2MIFB (0.2-0.3% C; 2.0-2.5 Cr, 0.8-1.0 Mo; 0.3-0.6 V; 0.3 Nb and 0.005 V). The increased part sizes of large power plants also complicate the effectiveness of heat treating processes. It has been shown that small changes in alloy content can improve heat treating properties considerably. Thus, increasing the Mn content in 15Kh1MIF from 0.4-0.7% to 0.9-1.1% decreases the critical cooling speed by one order of magnitude. The properties of low alloy perlite steels should be further improved by more complex alloying and, simultaneously with the alloy development, improved methods of heat treating; and manufacturing of these special-property alloys should be introduced. Orig. art. has: 4 figures.

ASSOCIATION: Tsentral'nyy nauchno-issledovatel'skiy institut tekhnologii mashinostroeniya (Central Scientific Research Institute of Machine Building Technology)

SUBMITTED: 28Oct64

NO REF SOV: 005

Card 2/2 BVK

ENCL: 00

OTHER: 000

SUB CODE: MM

MIRKIN, I.D.; TELLER, L. J.; PROKOPEVICH, A.N.

Low-alloy heat resistant steel for electric machinery manufacture.
Metalloved. i term. obr. met. no.11:4-9 N '65.

(MIRA 18:12)

1. Tsentral'nyy nauchno-issledovatel'skiy institut tekhnologii
i mashinostroyeniya.

L 14998-66 EWT(m)/EWP(w)/T/EWP(t)/EWP(k)/EWP(z)/EWP(b)/EWA(h) IJP(c) JD/HW/JG
ACC NR: AP5028563 (N) SOURCE CODE: UR/0126/65/020/005/0733/0740

AUTHOR: Guterman, M. B.; Mirkin, I. L.; Pavlyuk, A. A.; Pervakov, V. A.; Petrenko, N. S.; Khotkevich, V. I.

ORG: TsNII of Technology and Machine Building, Moscow (TsNII tekhnologii i mashino-
sstroyeniya); Kharkov gosuniversitet im. A. M. Gor'kiy (Khar'kovskiy gosuniversitet)

TITLE: Certain features connected with the K-state in Ni-Cr, Ni-Cr-Mo and Fe-Ni-
-Cr-Mo alloys

SOURCE: Fizika metallov i metallovedeniye, v. 20, no. 5, 1965, 733-740

TOPIC TAGS: metal physics, ordered alloy, mechanical property, resistivity, non-
ferrous metal alloy, ferrous alloy, metal heat treatment, heat resistant alloy,
high temperature strength, metal hardening

ABSTRACT: Changes in electrical resistivity in Ni + 15% Cr, Ni + 15% Cr + 18% Mo
and Fe + 25% Ni + 16% Cr + 6% Mo alloys were studied as a function of low tempera-
ture deformation (from +20° to -196°C) and annealing rate (from 2 to 10⁶ deg/min).
Decomposition of the K-state in the alloys was observed. The effect of the K-state
on high temperature strength was also noted. The K-state causes microscopic inho-

Card 1/2

UDC: 539.4.015

L 14998-66

ACC NR: AP5028563

homogeneities which retard the motion of dislocations. In this work, the influence of the decomposition of the K-state was studied in terms of high temperature strength. The temperature dependence of electrical resistivity was obtained as a function of temperature and heating rate. For each alloy, the resistivity increased initially and at 500°C reached a peak, whereupon it dropped to a minimum (about 700° to 900°C depending on the alloy) and rose again. The drop in resistivity was associated with the decomposition of the K-state. Deformation by compression (60 to 70%) in the temperature interval from -196 to +20°C showed that the decomposition of the K-state was practically independent of deformation temperature. At higher temperatures (between 500° and 1000°C) and at high rates of heating, the decomposition of the K-state was studied by increasing the heating rate to 10⁶ deg/min. The interval for the maximum decomposition was displaced to higher temperatures (300 to 450° higher), depending on the type of alloy. In the K-state region a significant strengthening was also noted when the speed of deformation was increased from 0.03%/min to 0.3%/min, while in the region of K-state decomposition no effect on strength was apparent. For fast heating rates, the rise in strength was maintained at higher temperatures than for slow heating rates. In particular, for Ni-Cr this region was expanded to 700°C, while for the other alloys to 900 or 1000°C. Where the K-state was decomposed at room temperature, no additional strengthening occurred upon pulse heating. Orig. art. has: 4 figures.

SUB CODE: 11/

SUBM DATE: 06Aug64/

ORIG REF: 011/

OTH REF: 003

Card 2/2

L 15215-66 EWT(m)/EWA(d)/EWP(t)/EWP(z)/EWP(b)/EWA(h) JD

ACC NR: AP6002906

SOURCE CODE: UR/0286/65/000/024/0072/0072

INVENTOR: Mirkin, I. L.; Trusov, L. P.; Dubrovskaya, Ye. F.;
Vasilevskiy, P. P.; Trubetsyn, N. A.; Yarovinskiy, L. M.

45
B

ORG: none

TITLE: Heat-resistant steel. Class 40, No. 177077. [announced by
the Central Scientific-Research Institute of Technology and Machine
Building (Tsentral'nyy nauchno-issledovatel'skiy institut tekhnologii
i mashinostroyeniya)]

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 24, 1965, 72

TOPIC TAGS: steel, low alloy steel, heat resistant steel, chromium
containing steel, molybdenum containing steel, nickel containing steel,
vanadium containing steel, niobium containing steel

ABSTRACT: This Author Certificate introduces a heat-resistant steel
containing chromium, molybdenum, nickel, vanadium, and niobium. To
improve the heat resistance, the content of alloying elements is set
as follows: 0.13—0.18% C, 1.8—2.3% Cr, 1.2—1.5% Mo, 0.55—0.70% V,
0.9—1.1% Ni, 0.08—0.15% Nb, and 0.005% B.

[ND]

SUB CODE: 11/ SUBM DATE: 11Apr64/ ATD PRESS: 4184

UDC: 669.15'26'28'24'292—194

L 24447-66 EWT(m)/ENP(w)/T/ENP(t) IJP(c) JD/HW/JT/GS
ACC NR: AT6010582 (N) SOURCE CODE: UR/0000/65/000/000/0161/0165

AUTHOR: Larikov, L. N.; Mirkin, I. L.; Zasluchuk, Ye. E.; Volkova, T. I.

ORG: Institute of Physics of Metals, AN UkrSSR (Institut metallofiziki AN UkrSSR);
TsNIITMASH, State Planning Committee, SSSR (TsNIITMASH pri Gosplane SSSR)

TITLE: Investigation of the effect which charge purity and melting conditions have
on the high-temperature strength and rate of growth of recrystallization centers in
deformed nickel- and iron-based alloys

SOURCE: AN UkrSSR. Mekhanizm plasticheskoy deformatsii metallov. (Mechanism of the
plastic deformation of metals). Kiev, Naukova dumka, 1965, 161-165

TOPIC TAGS: nickel base alloy, iron base alloy, refractory alloy, metal recrystal-
lization, high temperature strength

ABSTRACT: The authors study the effect of purification (by melting in a vacuum and
using charge materials refined by vacuum remelting) on the rate of growth of recrystallization centers and the refractory properties of multicomponent alloys. The
specimens were complex austenite alloys based on iron (0.05% C, 15% Cr, 32% Ni, 6% W)

Card 1/3

L 24447-66

ACC NR: AT6010582

and 3% Mo) and nickel (0.05% C, 13% Cr, 6% Mo, 6% W, 6% Co) containing no titanium or aluminum, i.e. the quantity of excess hardening phases was at a minimum. The alloys were melted and teemed under various conditions: 1. in air from commercially pure metals (1N and 1Zh where N indicates a nickel-based alloy and Zh indicates an iron-based alloy); 2. in a deep vacuum ($1 \cdot 10^{-4}$ mm Hg) from commercially pure metals (2N and 2Zh); 3. in a deep vacuum from metals previously remelted in a vacuum (3N and 3Zh). Specimens measuring $5 \times 5 \times 10$ mm were cut from the ingots and annealed for 8 hours at 1150°C and then deformed to 80% by uniaxial compression at room temperature. The specimens were then subjected to recrystallization annealing with holding from 15 minutes to 8 hours at temperatures of $650-800^\circ\text{C}$. The temperature during annealing was held constant to within $\pm 1^\circ$. A surface layer of the order of tenths of a millimeter was removed by etching in aqua regia (nickel alloys) or in an alcohol solution of nitric acid (iron alloys). The rate of growth of the recrystallization centers was evaluated from the time necessary for reaching the first centers of a given size at a given temperature. It was found that the high-temperature strength of iron alloy is considerably increased by melting and teeming in a vacuum. Graphs are given showing the linear rate of growth in recrystallization centers as a function of temperature. These curves show that charge purity and melting conditions have a weak effect on the rate of growth of recrystallization centers

Card 2/3

L 24447-66

ACC NR: AT6010582

throughout the entire range of temperatures and annealing times studied, although a tendency for acceleration of recrystallization processes was observed in more highly refined alloys. Empirical formulas are given for determining the rate of growth in recrystallization centers for nickel and iron alloys. Orig. art. has: 1 figure, 3 formulas.

SUB CODE: 11/ SUBM DATE: 16Sep64/ ORIG REF: 006/ OTH REF: 005

Card 3/3 dda

L 4005/-00 ENI(m)/T/ENP(w)/ENF(t)/ETI LJP(c) JD
ACC NR: AP6016585 (N) SOURCE CODE: UR/0129/66/000/005/0017/0020

AUTHORS: Mirkin, I. L.; Rybakova, Yu. A.; Yudin, A. A.

ORG: TsNIITMASH

TITLE: Some regularities of the development of sources of failure in creep conditions

SOURCE: Metallovedeniye i termicheskaya obrabotka metallov, no. 5, 1966, 17-20

TOPIC TAGS: creep mechanism, copper, nickel alloy, material failure / M: copper, KhN70VMYuT nickel alloy

ABSTRACT: The mechanism of failure and the kinetics of growth of voids in failure in creep conditions are investigated. This study is related to the presence and growth of voids in the material. Materials used in the study were M1 copper and two nickel alloys, one of which was a single-phase nickel-aluminum hard mixture, and the other was alloy KhN70VMYuT with a heterogeneous structure. The specimens were prepared by thermal process and were subjected to tensile testing at temperatures of 700, 750, and 850C for periods of 500, 1000, 4000, and 10000 hours for the nickel-bearing alloys; the copper specimens were stretched at 500, 450, and 400C for 1000 hours following annealing at 520C. Microsections of the materials were studied to measure pore growth. It was noted that

$$\frac{\sigma}{\sqrt{N}} = A = \text{const.}$$

Card 1/2

USSR 62.112.124.3.100

L 40050-66

ACC NR: 16001658

where J is the applied stress, and n is the number of pores. Plots are given showing the variation of the number of pores n with temperature-time conditions. It is concluded that it is possible that the J in Sharikov's formulas is an effective indicator of critical stress, however, sufficient experimental data are still lacking. Orig. art. in *Engineering and Technology*.

SUB CODE: 11/ SUBM DATE: none/ ORIG REF: 006

Card 1/1

L 39051-60 PVI(m)/1.1 11710 JD/11/10/11

ACC NR: AP6020910

SOURCE CODE: UR/0369/66/002/002/0149/0151

AUTHOR: Mirkin, L. I.; Shchukin, Ye. D.

ORG: MGU im. M. V. Lomonosov; Institute of Physical Chemistry, AN SSSR, Moscow
(Institut fizicheskoy khimii AN SSSR)

TITLE: Formation of a solid solution during a quasi-spontaneous internal dispersion of tin in the presence of liquid gallium.

SOURCE: Fiziko-khimicheskaya mekhanika materialov, v. 2, no. 2, 1966, 149-151

TOPIC TAGS: solid solution, tin alloy, gallium alloy, liquid metal, chemical dispersion

ABSTRACT: Changes in the lattice constants of tin in the presence of liquid gallium were investigated. Alloys thought to contain a solid solution were obtained in two ways: (1) deposition of a layer of gallium on the surface of a tin single crystal, and (2) mixing tin and gallium in the liquid state, then cooling at various rates. The lattice constants were measured with a URS-50I x-ray apparatus. The size of the unit cell of tin was found to decrease upon introduction of gallium: a decreased from 5.816 to 5.778 Å, i. e., by 0.7%, and c from 3.183 to 3.164 Å, i. e., by 0.6%. The observed substantial decrease in lattice parameters, associated with the formation of a solid solution of gallium in tin, is considered to be quite natural, since the lattice of tin is not close-packed, the radii of atoms and ions of tin are larger than

Card 1/2

L 0001-00

ACC NR: AP6020910

those of gallium, and tin has a lower valence. The results, which indicate the formation of a tin-gallium solid solution during quasi-spontaneous internal dispersion, are in full accord with theoretical representations of this process. Orig. art. has: 2 figures.

SUB CODE: 11/ SUBM DATE: 15June65/ ORIG REF: 006

Card 2/2

L 40308-66 INT(m)/RDP(w)/T - P(t)/BTI LHP(c) JPL 10/10
ACC NR: AP6017308 (A)

SOURCE CODE: UR/0126/66/021/005/0762/0769

AUTHORS: Mirkin, I. L.; Kanchev, O. D.

ORG: TsNIITMASH

TITLE: X-ray structural parameters and tensile strength of $\frac{Ni}{27}-\frac{Cr}{27}-\frac{Al}{27}$ alloys

SOURCE: Fizika metallov i metallovedeniye, v. 21, no. 5, 1966, 762-769

TOPIC TAGS: chromium containing alloy, aluminum containing alloy, metal property, plasticity, hardness, nickel base alloy

ABSTRACT: The strength parameters of three dispersion hardening Ni--Cr--Al alloys having three relationships between the crystal lattice periods of the matrix and the Ni_3Al phase (i.e., $\Delta a \approx 0$ where $\Delta a = a_\gamma - a_{\gamma'}$) were investigated. The Ni, Cr, and Al composition of the three alloys was 82.1, 9.6, 8.3(I); 76.0, 16.8, 7.2(II), and 65.5, 27.6, and 6.9%(III) respectively. The mechanical properties of the alloys at 20 and 700C are shown in Fig. 1. In addition to the results shown in Fig. 1 it was found that: hardness increases with increasing Cr content but seems independent of Δa ; yield stress does not seem to depend on Δa ; plasticity is a function of Δa and has a maximum at $\Delta a \approx 0$; long duration strength is maximum for $\Delta a \approx 0$. S. A. Yuganova, M. S. Blanter, and Yu. A. Sorokina took part in the work.

UDC: 539.4

Card 1/2

ACC NR: AT6034451

(N)

SOURCE CODE: UR/0000/66/000/000/0148/0153

AUTHOR: Mirkin, I. L.; Rybakova, Yu. A.

ORG: none

TITLE: Kinetics of the growth of failure sites in nickel alloys under conditions of creep

SOURCE: AN SSSR. Institut metallurgii. Svoystva i primeneniye zharoprochnykh splavov (Properties and application of heat resistant alloys). Moscow, Izd-vo Nauka, 1966, 148-153

TOPIC TAGS: nickel base alloy, material failure, creep

ABSTRACT: The materials for the investigation were Brand NO nickel, remelted in vacuum; a single phase nickel-base solid solution (Ni + 28.6 Cr + 2.3 Al) . All the materials were tested after long term high temperature deformation under different stresses. Nickel was tested after deformation for 6, 100, 200, and 1880 hours at temperatures of 500 and 700°C; alloys I (Ni + 28.6 Cr + 2.3 Al) and II (Ni + 26.6 Cr + 3.5 Al) after deformation for 100, 600, and 1000 hours at a temperature of 700°C; alloy III (a heterogeneous commercial nickel base heat resistant alloy Type EI705) after deformation for 4200 hours at a temperature of 850°C. The slides were examined under an optical microscope with magnifications up to 1350 times. The change in pore

Cord 1/2

ACC NR: AT6034451

diameter was measured with an accuracy of 0.4 microns using an ocular micrometer. It was established that the number of pores in a unit area of the slide increases sharply with etching during the course of the first 3-5 seconds, but that with etching beyond 5 seconds, the number remains constant. The transverse pore dimension, as a function of the etching time, increases almost linearly. In pure nickel a well developed substructure was observed under all experimental conditions. Failure of all the samples occurred at the boundary. It was found that for alloy EI765, in the stress interval 6-1.44 kg/mm², the transverse pore dimension does not depend on the stress, but the number of pores increases. For all the alloys the stress σ and the mean distance between pores L were found to be inversely proportional. The experimental data correspond to the theory of the growth of pores during creep, due to diffusion and the formation of vacancies. Orig. art. has: 2 formulas and 3 figures.

SUB CODE: 11/ SUBM DATE: 10Jun66/ ORIG REF: 005/ OTH REF: 006

Card 2/2